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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/792,108	03/03/2004	Bruce E. Kreischer	210557US (4081-04500)	4102

37814 7590 06/29/2007
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EXAMINER	
BOYER, RANDY	
ART UNIT	PAPER NUMBER
1764	
MAIL DATE	DELIVERY MODE
06/29/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/792,108	KREISCHER, BRUCE E.	
	Examiner	Art Unit	
	Randy Boyer	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 May 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16,20-26 and 28-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16,20-26 and 28-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Examiner acknowledges response filed 16 May 2007 containing amendments to the claims, replacement sheet for Fig. 1, and remarks.

2. The previous rejection of claims 1-8 under 35 U.S.C. 102(e) are withdrawn in view of Applicant's amendments to the claims. Likewise, the previous rejection of claims 9-13 under 35 U.S.C. 102(b) are withdrawn in view of Applicant's amendments to the claims.

3. The previous rejection of claims 14-16, 20-26, and 28-34 under 35 U.S.C. 103(a) are maintained.

4. New grounds for rejection necessitated by Applicant's amendments to the claims are entered with respect to claims 1-13. The rejections follow.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1-8, 14-16, 20-26, and 28-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dixon (WO 03/053890 A1) in view of Seader et al., *Perry's Chemical Engineers' Handbook*, 7th ed. New York, McGraw Hill, 1997, pp. 13-4 – 13-9.

8. With respect to claim 1, Dixon discloses a method for separating an oligomerization reactor effluent comprising: (a) separating the oligomerization reactor effluent (9) into a liquid portion (17) and a vapor portion (10); (b) feeding the liquid portion (17) of the oligomerization effluent (9) to a liquid feed inlet on a distillation column (4); (c) feeding the vapor portion (10) of the oligomerization reactor effluent (9) to a vapor feed inlet on a second distillation column (3); and (d) withdrawing an oligomerization product stream (11).

Dixon does not disclose wherein the liquid and vapor portions of the oligomerization reactor effluent are fed to the same distillation column, and wherein the oligomerization product is withdrawn from a side drawn outlet located between the liquid feed and vapor feed inlets to the column.

However, Dixon discloses that his invention is not in any way limited to the process flow diagram of his Figure 2, which only shows a single embodiment of the

process of his invention (see Dixon, page 14, lines 20-26). In addition, Seader discloses a thermally coupled separation system for the separation of a ternary stream in which a first separator is used to separate the majority of light components into the vapor phase and heavy components into the liquid phase (see Seader, page 13-5). The vapor and liquid product streams from the first separator are then directed to a second separator (i.e. distillation column) wherein all three products are produced, with the middle product (corresponding to the intermediate boiling species) being taken off as a sidestream whose outlet is located at a point between the vapor feed inlet and liquid feed inlet from the first separator (see Seader, page 13-5, and page 13-8, Figure 13-6b). Seader explains that such a separation scheme is particularly useful for reducing energy requirements when the initial feed contains close-boiling species (e.g. those present in the oligomerization reactor effluent stream of Dixon) (see Seader, page 13-5). Additionally, Seader discloses use of a single-stage flash (e.g. for use as a first separator in the separation scheme) where the relative volatility between two components to be separated is relatively large (e.g. the unreacted ethylene and 1-hexene product present in the oligomerization reactor effluent of Dixon), or where only a partial separation is to be made (e.g. for partial separation of the 1-hexene product in the oligomerization reactor effluent of Dixon) (see Seader, page 13-6, and page 13-9, Figure 13-7a).

Therefore, the person having ordinary skill in the art of separating oligomerization reactor effluent streams would have been motivated to modify the process of Dixon to provide for (1) flashing the oligomerization reactor effluent in a single-stage flash of the

type disclosed by Seader, and (2) feeding the liquid and vapor portions of the oligomerization reactor effluent to the same distillation column, and withdrawing the oligomerization product from a side drawn outlet located between the liquid feed and vapor feed inlets to the column (as suggested by the various distillation flow schemes of Seader) in order to achieve greater process efficiency and improved economics and to complete separation of the effluent stream into three individual process streams: (a) a lights stream comprised primarily of ethylene, (b) a product stream comprised primarily of 1-hexene and solvent, and (c) a heavies stream comprised primarily of solvent and other residual components.

Finally, the person having ordinary skill in the art of separating oligomerization reactor effluent streams would have had a reasonable expectation of success in modifying the process of Dixon as described above because (1) Dixon explains that the process of his invention is not in any way limited to the single embodiment shown in his Figure 2 (i.e. Dixon contemplates a modification of his process as shown); (2) Seader discloses the use of a single-stage flash where only a partial (i.e. preliminary) separation is to be made (e.g. partial separation of the 1-hexene product present in the oligomerization reactor effluent of Dixon); and (3) Seader discloses the use of a single column coupled to a prefractionator (which allows for a split of the intermediate component to be separated, e.g. the 1-hexene product present in the oligomerization reactor effluent of Dixon) for separation of a ternary feed.

9. With respect to claim 2, Dixon discloses wherein the oligomerization reactor effluent is from a trimerization reactor (see Dixon, page 3, lines 12-15).

10. With respect to claim 3, Dixon discloses wherein the oligomerization reactor effluent is from trimerization of ethylene to 1-hexene (see Dixon, Example 6).

11. With respect to claims 4-7, Dixon discloses wherein the solvent comprises cyclohexane (see Dixon, Example 6 and Table 2).

12. With respect to claim 8, Dixon discloses wherein the oligomerization reactor effluent comprises a catalyst system (see Dixon, page 15, lines 3-6).

13. With respect to claim 14, Dixon discloses wherein the oligomerization product stream comprises 1-hexene and solvent (see Dixon, page 15, lines 20-22).

14. With respect to claim 15, Seader discloses the flashing of a multi-component stream (see Seader, page 13-6, and page 13-9, Figure 13-7a).

15. With respect to claim 16, Seader discloses wherein distilling is performed in a common distillation column (see Seader, page 13-8, Figure 13-6b).

16. With respect to claim 20, Seader discloses wherein the distillation column comprises a number of stages between the liquid feed inlet and side draw outlet effective to separate heavies (i.e. bottoms product) from the intermediate product (see Seader, page 13-8, Figure 13-6b).

17. With respect to claim 21, Seader discloses wherein the distillation column comprises a number of stages between the vapor feed inlet and the side draw outlet effective to separate lights (i.e. overhead product) from the intermediate product (see Seader, page 13-8, Figure 13-6b).

18. With respect to claim 22, Dixon discloses separating 1-hexene and cyclohexane from the oligomerization product stream (see Dixon, page 15, lines 20-22).

19. With respect to claim 23, Dixon discloses wherein the oligomerization reactor effluent having a composition greater than 90% by weight of C_6 components (see Dixon, Table 2).

20. With respect to claim 24, Seader discloses wherein the liquid portion is expected to comprise a portion of the component(s) of intermediate volatility as well as other heavy components (see Seader, page 13-5).

21. With respect to claim 25, Seader discloses wherein the vapor portion is expected to comprise a portion of the component(s) of intermediate volatility as well as other light components (see Seader, page 13-5).

22. With respect to claim 26, Seader discloses wherein the component(s) of intermediate volatility are concentrated in the intermediate product stream (see Seader, page 13-5, and page 13-8, Figure 13-6b).

23. With respect to claim 28, Seader discloses a system for separating an effluent comprising (a) a vapor/liquid separator to flash the effluent into a vapor portion and liquid portion (see Seader, page 13-9, Figure 13-7a); and (b) a distillation column in fluid communication with the vapor/liquid separator, wherein the distillation column has a side draw for withdrawing a product stream and receives as separate feeds the vapor portion and the liquid portion from the vapor/liquid separator (see Seader, page 13-8, Figure 13-6b).

24. With respect to claim 29, Seader discloses wherein the liquid portion is fed to the distillation column at a location below the side draw (see Seader, page 13-8, Figure 13-6b).

25. With respect to claim 30, Seader discloses wherein the vapor portion is fed to the distillation column at a location above the side draw (see Seader, page 13-8, Figure 13-6b).

26. With respect to claims 31 and 32, Dixon discloses a trimerization reactor for providing oligomerization reactor effluent, wherein the trimerization reactor is in fluid communication with the vapor/liquid separator, and wherein the second distillation column separates trimerization product from solvent (see Dixon, Figure 2).

27. With respect to claim 33, it is known in the art to use additional distillation columns to further resolve a binary stream.

28. With respect to claim 34, Seader discloses wherein the distillation column has at least 3 off-takes and at least 2 inputs (see Seader, page 13-8, Figure 13-6b).

29. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodard (WO 99/19280) in view of Seader et al., *Perry's Chemical Engineers' Handbook*, 7th ed. New York, McGraw Hill, 1997, pp. 13-4 – 13-9.

30. With respect to claim 1, Woodard discloses a method for separating an oligomerization reactor effluent comprising: (a) separating the oligomerization reactor effluent (6, 8) into a liquid portion (12) and a vapor portion (11); (b) feeding the liquid portion (12) of the oligomerization effluent (6, 8) to a liquid feed inlet on a distillation column (41); (c) feeding the vapor portion (11) of the oligomerization reactor effluent (6, 8) to a vapor feed inlet on a second distillation column (13); and (d) withdrawing an oligomerization product stream.

Woodard does not disclose wherein the liquid and vapor portions of the

oligomerization reactor effluent are fed to the same distillation column, and wherein the oligomerization product is withdrawn from a side drawn outlet located between the liquid feed and vapor feed inlets to the column.

However, Woodard discloses that his invention is not in any way limited to the process flow diagram of the Figures 1 through 6 that show different embodiments of the process of his invention. In addition, Seader discloses a thermally coupled separation system for the separation of a ternary stream in which a first separator is used to separate the majority of light components into the vapor phase and heavy components into the liquid phase (see Seader, page 13-5). The vapor and liquid product streams from the first separator are then directed to a second separator (i.e. distillation column) wherein all three products are produced, with the middle product (corresponding to the intermediate boiling species) being taken off as a sidestream whose outlet is located at a point between the vapor feed inlet and liquid feed inlet from the first separator (see Seader, page 13-5, and page 13-8, Figure 13-6b). Seader explains that such a separation scheme is particularly useful for reducing energy requirements when the initial feed contains close-boiling species (e.g. those present in the oligomerization reactor effluent stream of Woodard) (see Seader, page 13-5). Additionally, Seader discloses use of a single-stage flash (e.g. for use as a first separator in the separation scheme) where the relative volatility between two components to be separated is relatively large (e.g. the unreacted ethylene and 1-hexene product present in the oligomerization reactor effluent of Woodard), or where only a partial separation is to be

made (e.g. partial separation of the 1-hexene product present in the oligomerization reactor effluent of Woodard) (see Seader, page 13-6, and page 13-9, Figure 13-7a).

Therefore, the person having ordinary skill in the art of separating oligomerization reactor effluent streams would have been motivated to modify the process of Woodard to provide for (1) flashing the oligomerization reactor effluent in a single-stage flash of the type disclosed by Seader, and (2) feeding the liquid and vapor portions of the oligomerization reactor effluent to the same distillation column, and withdrawing the oligomerization product from a side drawn outlet located between the liquid feed and vapor feed inlets to the column (as suggested by the various distillation flow schemes of Seader) in order to achieve greater process efficiency and improved economics and to complete separation of the effluent stream into three individual process streams: (a) a lights stream comprised primarily of ethylene, (b) a product stream comprised primarily of 1-hexene and solvent, and (c) a heavies stream comprised primarily of solvent and other residual components.

Finally, the person having ordinary skill in the art of separating oligomerization reactor effluent streams would have had a reasonable expectation of success in modifying the process of Woodard as described above because (1) Woodard explains that the process of his invention is not in any way limited to the different embodiments shown in his Figures 1 through 6 (i.e. Woodard contemplates a modification of his process as shown); (2) Seader discloses the use of a single-stage flash where only a partial (i.e. preliminary) separation is to be made (e.g. partial separation of the 1-hexene product present in the oligomerization reactor effluent of Woodard); and (3) Seader

discloses the use of a single column coupled to a prefractionator (which allows for a split of the intermediate component to be separated, e.g. the 1-hexene product present in the oligomerization reactor effluent of Woodard) for separation of a ternary feed.

31. With respect to claims 2 and 3, Woodard discloses wherein the oligomerization reactor effluent is from trimerization of ethylene to 1-hexene (see Woodard, page 1, lines 20-26).

32. With respect to claims 4-7, Woodard discloses wherein the solvent comprises cyclohexane (see Woodard, page 9, lines 14-19).

33. With respect to claim 8, Woodard discloses wherein the oligomerization reactor effluent comprises a catalyst system (see Woodard, page 2, lines 23-28).

34. With respect to claim 9, Woodard discloses a catalyst system composed of a chromium source (see Woodard, page 2, lines 23-24), a pyrrole-containing compound (see Woodard, page 2, lines 23-24), a methyl alkyl (see Woodard, page 5, lines 5-7), and a halide source (see Woodard, page 6, line 27).

35. With respect to claim 10, Woodard discloses a method of separating an oligomerization reactor effluent, further comprising killing the catalyst system prior to distilling the portions of the oligomerization reactor effluent (see Woodard, Figure 1).

36. With respect to claims 11-13, Woodard discloses wherein the catalyst system is killed with an alcohol (see Woodard, page 15, lines 28-30).

Response to Arguments

37. Applicant's arguments filed 16 May 2007 have been fully considered but they are not persuasive.

38. Examiner understands Applicant's principal arguments to be:

I. The prior art of record does not establish a *prima facie* case of obviousness as to the pending claims.

II. Examiner's replacement of the prefractionator (i.e. first column) of Seader's Fig. 13-6(b) with the flash drum of Seader's Fig. 13-7(a) is only accomplished via the impermissible use of hindsight in view of Applicant's disclosure.

III. Any modification to eliminate the prefractionator of Seader's Fig. 13-6(b) would impermissibly destroy the fundamental operability of the Petlyuk distillation towers configuration.

39. With respect to Applicant's first argument, Examiner submits that a *prima facie* case of obviousness has been made with respect to the pending claims, support for which can be found at paragraphs 7 through 36 *supra*.

40. With respect to Applicant's second argument, Examiner first notes the submission by Applicant of "Appendix A" which can be found attached to Applicant's remarks filed 16 May 2007. Examiner has considered "Appendix A" and has found that it does not accurately represent the proposed combination of features from Seader which Examiner has relied on as the basis for the obviousness rejection. Consequently, Applicant's arguments with respect to the proposed combination shown in "Appendix A" are considered moot and therefore not addressed herein.

To clarify, it is Examiner's position that Applicant's claims are unpatentable over Dixon or Woodard in view of Seader because all of Applicant's claim limitations can be met by simply modifying the processes or Dixon or Woodard in light of Seader's teachings. In this regard, Examiner finds that the processes of Dixon or Woodard can be modified to either (1) perform the claimed separation by using the setup of Seader's Fig. 13-6(b) as it is shown in that figure with the first column (which Seader refers to as a "prefractionator") serving as a means for "flashing the oligomerization reactor effluent into a liquid portion and a vapor portion"; or (2) perform the claimed separation by replacing the first column (i.e. "prefractionator") of Seader's Fig. 13-6(b) with the flash drum of Seader's Fig. 13-7(a) and whereby the flash drum would deliver separate vapor and liquid input streams to the second column of Seader's Fig. 13-6(b).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. *See* MPEP § 2145(X)(A) (citing *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971)).

In this regard, Examiner notes that Seader discloses the use of a single-stage flash drum as shown in Fig. 13-7(a) for situations where only a partial separation is to be made (e.g. for performing a partial separation of the 1-hexene product of either

Dixon or Woodard) (see Seader, page 13-6, first full paragraph). Moreover, Examiner understands the function of Seader's first column, or "prefractionator," of Fig. 13-6(b) to be exactly what its name implies – namely, to "prefractionate" or "partially separate" the components of the feed stream. Thus, in the context of Applicant's claims and in view of Seader's teachings along with those of Dixon and Woodard, Examiner finds the prefractionator of Seader's Fig. 13-6(b) and single-stage flash drum of Seader's Fig. 13-7(a) to be completely interchangeable for performing the claimed separation of oligomerization reactor effluent, because the function of both the prefractionator and the single-stage flash drum are exactly the same – to provide a partial separation of the feed.

Therefore, Examiner submits that the replacement of the prefractionator of Seader's Fig. 13-6(b) with the flash drum of Seader's Fig. 13-7(a) did not come from Examiner's impermissible use of hindsight in view of Applicant's disclosure, but rather from the *explicit* teachings of Seader in light of the understanding of one having ordinary skill in the art of separation processes.

41. With respect to Applicant's third argument, Examiner submits that elimination of the prefractionator of Seader's Fig. 13-6(b) would not destroy operability of the Petlyuk distillation towers configuration.

First, Examiner notes that while Seader (in Fig. 13-6(b)) discloses reflux of liquid and vapor from the main column back to the prefractionator (i.e. first column), he does not specify any minimum reflux ratio. Thus, Examiner finds that replacement of the prefractionator of Seader's Fig. 13-6(b) with the flash drum of Seader's Fig. 13-7(a) (and

having no reflux back to the flash drum) would not operate any differently than the setup as shown in Fig. 13-6(b) having a very small reflux ratio (i.e. the ratio of the amount of condensate or vapor being returned to the amount being withdrawn).

Second, Examiner notes that the court has emphasized that the proper inquiry is "'whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination,' not whether there is something in the prior art as a whole to suggest that the combination is the *most desirable* combination available" (emphasis added). *See* MPEP § 2143.01(I) (citing *In re Fulton*, 391 F.3d 1195, 73 USPQ2d 1141 (Fed. Cir. 2004)).

Thus, while having a flash drum with no means for reflux serve as the prefractionator of Seader's Fig. 13-6(b) may not be the "most desirable" combination in the context of a Petlyuk separation system, Examiner submits that the operability of such a system would not be "destroyed," and indeed would not be any worse than a thermally coupled system (i.e. having a prefractionator with reflux thereto) with a very small reflux ratio.

Conclusion

42. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

43. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randy Boyer whose telephone number is (571) 272-7113. The examiner can normally be reached Monday through Friday from 8:00 A.M. to 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola, can be reached at (571) 272-1444. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RPB

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